

ULTRA VIOLET LIGHT
WITH SPECIAL REFERENCE TO ITS USE IN
DISEASES OF THE SKIN.

T H E S I S
Submitted for the
M.D. Edinburgh

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Jocelyn Mary Spencer Scovell

M.B., Ch.B. 1923.

Clinical Assistant St. John's Hospital for
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SECTION I.

INTRODUCTION.

The value of light as a therapeutic agent has long been recognised. From the earliest ages man has instinctively worshipped the sun, realising subconsciously that it was necessary for his life and growth, but any attempt to use it for therapeutic purposes has been, up to comparatively recent years, purely empirical.

Now, however, we have gained some knowledge as to the physical properties of light and are thus able to classify the rays, at least, to some extent, according to their length and therapeutic properties. To begin with, the term "light" is misleading. Light implies visibility and we now know that the visible rays occupy but a very small portion of the solar spectrum. These rays may be either too long or too short to be detected by the naked eye, and the range is a very extensive one from the invisible heat waves, or infra red waves, which are roughly 6 octaves, the visible or luminous waves occupying about one octave and then the Ultra Violet waves which occupy about half an octave.

But we do not stop at the solar spectrum. Certain phosphorescent and so-called radio active bodies emit even shorter waves, the gamma waves. These are the shortest known waves and then we have the X rays, only a little longer, and these are well known to have remarkable therapeutic properties.

The various terms X ray therapy, radio therapy, and helio therapy, Ultra Violet Rays therapy, Actinotherapy, etc. etc., can all be included under the general term radiation therapy, which signifies treatment by the various rays or wave lengths of ether, whether they emanate from the visible or invisible solar spectrum, radio active bodies or X rays.

As has been stated before, it is only of late years, that our improved knowledge of physics has opened up this new and wide therapeutic field. We have made great strides, we know the therapeutic effects of X rays, we have evolved a method of correct dosage, we know the effect of over dosage, both immediate and remote, but we are not so far advanced in our knowledge of the therapeutic value of Ultra Violet rays, we have no knowledge of the remote effects of prolonged exposures. We have no really satisfactory method of accurate dosage, though several have been suggested; we know they have very little power of penetration, we have little knowledge of how and why they act.

The whole subject is in its infancy. It is true, we have proved that these rays have a remarkable therapeutic value, at all events in certain diseases, such as tuberculosis and rickets, but we must proceed cautiously. Ultra Violet rays are not a panacea for all ills, indeed in some cases they may do harm.

We receive glowing reports from enthusiasts but the test of time has not yet been applied to the treatment. Nevertheless, undoubtedly good results have been obtained, and these are more than sufficient to call for further investigation and research in this new branch of therapeutics. Especially perhaps, does this new form of treatment appeal to dermatologists, for here, in addition to the general action, about which little is known, we have a decided local irritant and stimulant with strong bactericidal properties, both directly on the surface and indirectly through the blood to the deeper tissues.

Of this, we have proof, and as most of the local measures used in the treatment of diseases of the skin, such as ointments, lotions, etc. are useful, chiefly for the above properties, it would appear that Ultra Violet therapy is based on rational principles and should have a large sphere of utility in most skin conditions.

The writer has had the opportunity of working in the Electro-therapeutic and Ultra Violet ray Department of St. John's Hospital for Diseases of the skin, Leicester Square, London, for the past two years, and in the present thesis proposes to give an outline of the present position of the subject, especially from the point of view of the dermatologist, based on her own observations, of a series of cases so treated.

SECTION II.

HISTORICAL OUTLINE.

Helio-therapy in itself is a very ancient form of treatment, and yet it is apt to be looked upon as an entirely new method. It is only our modern conception of light, our present mode of application and ability to produce artificial rays similar to those produced by natural sunlight, that can be labelled "new".

From earliest ages, man has instinctively realised the sun to be a great and powerful source of life-giving properties. Many of the earliest forms of religion were founded on sun worship, the sun being looked upon as the creator of life.

The ancient Egyptians, the Greeks and the Romans were firm believers in the health-giving powers of the sun's rays, and the well-to-do Romans had their special sun rooms or solaria, built into their villas. Hippocrates, Galen and Celsus all thought that the sun was a powerful therapeutic agent. Then came a blank during the mediaeval period of history.

Sir Isaac Newton by his discovery of the sun and spectrum in 1666 was the originator of our present theory of light, or rather radiant energy. It is true, he himself only realised that visible light or white light could be split up into wave lengths. He knew nothing of the existence of invisible waves and the vast field they would open up for present/

present day therapeutics. It was not until the beginning of the 19th century when in 1800 Herschel placed the bulb of a clinical thermometer at the red end of the spectrum and found that it began to rise. Not only at the red end, but also when placed beyond the spectrum. He thus discovered the invisible heat or infra red waves. The following year Ritter noticed that silver chloride was blackened by invisible rays just beyond the violet end and these he called Ultra Violet Rays.

As far back as 1774 we have instances of attempts to use sunlight as a therapeutic agent. Faure is said to have treated ulcers by such a method and others by means of lenses tried to focus the rays on to offensive and suppurating wounds.

Later in 1815, Loebel advised general radiation rather than local, and in 1887 Downes and Blunt discovered the bactericidal properties of light which were also confirmed by Koch in 1890 when he showed that tubercle bacilli, taken from the sputum and spread in a thin film on a glass slide, were killed in 10 minutes when exposed to the sun's rays.

Since the discovery of X rays by Roentgen in 1896 and of Radium by Madame Curie a few years later, another great advance was made in our conception of radiant energy, and the therapeutic possibilities have attracted a large number of workers. Perhaps the largest number of cases treated by Ultra Violet Radiation have been those suffering from/

from tuberculosis. Finsen is famous for his attempt to cure lupus by light. At first he used ordinary sunlight but found the sun so unreliable that he turned his attention to artificial sources. He used the carbon arc as that had been found to have a spectrum very similar to that of the sun, and later he even preferred the artificial means to the natural as he found he could obtain a light richer in Ultra Violet rays, those of the sun being so easily absorbed by the atmosphere. Finsen applied his rays with pressure on the part to procure greater penetration, his aim being to kill the bacilli which Koch had shown were so sensitive to light, and his method is used to-day, the Kromayer lamp and various quartz applicators being designed for this purpose.

Rollier, too, is famous for his treatment of tuberculosis by sunlight, but he uses the general irradiation rather than local treatment and natural rather than artificial means. In 1903 he started his clinic at Leysin in the Alps, and at the same time founded our modern conception of heliotherapy. A brief summary of his methods may be included here.

The "sun cure" consists in the exposure of part of, or all the body, to the direct action of the sun's rays, and to the cool and stimulating mountain air. There is a carefully graded dosage and time of day for "insolation" and method of exposure. A general dosage table based empirically/

empirically on twenty years' experience is followed during the first few weeks until the patient is acclimatised and pigmented all over the body. The winter is regarded as the ideal time to begin treatment, the sun can be tolerated for a longer period in the cool stimulating air owing to the decreased intensity of the heat waves, but of course it is necessary for the patients to be well acclimatised before full exposure to the winter Alpine air.

The general dosage table now adopted is as follows:-

First day. Ankles only, 5 min.

Second day. Ankles, 10 min. and calves 5 min.

Third day. Ankles, 15 min. calves 10 min. and thighs 5 min.

and so on up to ten days of treatment. This is carried out three times a day between 5 a.m. and 9 p.m. in summer and 11 a.m. and 2 p.m. in winter. As the patient proceeds to complete pigmentation these periods of insolation are lengthened and their frequency diminished and finally the whole body may be exposed with impunity for as long as 3 hours. Except in lupus, the face and head are not exposed to the direct rays. The rate of pigmentation varies considerably with different individuals. As a rule blonde people pigment slowly. In this country Sir Henry Gauvain has started a Light clinic at Alton and at Hayling Island, when the weather is suitable; he uses similar methods to those described above. Only in England, summer is the suitable time as there is so little sun in the winter months, and/

and the sea takes the place of the snow by absorbing the heat waves and reflecting back the Ultra Violet. When sunlight is not available, he supplements this treatment by various forms of arc lamp and at Alton he has well fitted Light rooms for every form of treatment.

Other well known workers are Drs. Sequeira, Leonard Hill, Hall etc. Actinotherapy is not confined to cases of tuberculosis. Nowadays it is used for an extraordinarily large number of diseases, but an especially large class may be reserved for diseases of the skin. At Dr. Rollier's clinic the physician in charge of the psoriasis cases claims that five minutes' sun is preferable to 5% chrysarobin. A definite opinion on that statement cannot be given, but he is at least certain that the parts of the body exposed to the sun compare favourably with, and are in striking contrast to, the unexposed regions.

A recent private communication received from Dr. Rollier confirms the good results obtained in skin diseases. Dr. Rollier writes that ten cases of psoriasis have been treated in his clinic and that the results have been most encouraging. A note by Dr. Rollier on the treatment of psoriasis also appears in the "Revue d'Actinologie" for October - December 1925.

Three photographs of a psoriasis cases taken at his clinic at Leysin are appended here.

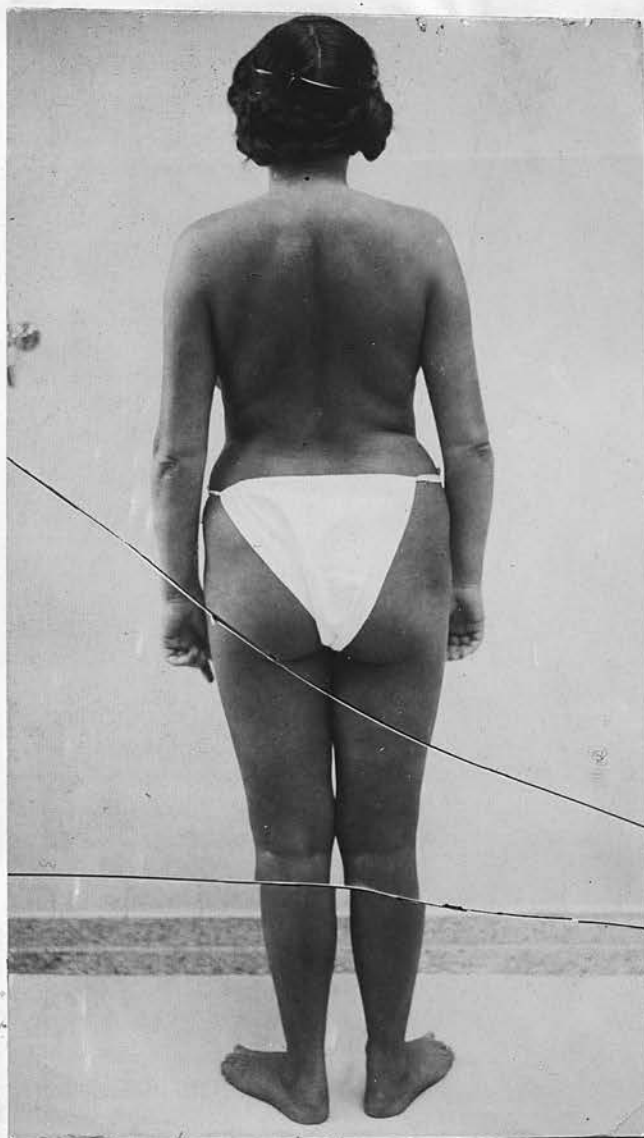
No. 1 before treatment.



No. 2 shows pigmented healthy skin and pale areas of psoriasis.



No. 3 Uniformly pigmented healthy skin.



Also in the Swiss Military clinic there is not one case of acne, psoriasis, soborrhoea or furunculosis, though these conditions are generally frequent in Military clinics. To-day nearly every hospital, general and special, has its Light department, and Light clinics are springing up everywhere.

Actinotherapy is becoming so popular, almost too popular, for in many cases it has fallen into the hands of the unqualified, and as cases need to be carefully selected and doses carefully regulated, much harm may be done, and it is to be hoped that the treatment will not fall into disrepute as its utility in many branches of medicine is an undoubted fact.

SECTION III.

GENERAL OBSERVATIONS ON THE NATURE OF LIGHT AND LIGHT THERAPY.

The Physical basis of light is a series of ether waves which stimulate the retina. The retina, however, is sensitive to relatively few waves, and there is a vast field of rays whose wave length is either too long or too short to be detected by the human eye.

Luckiesh (Ultra Violet Radiation) gives some idea of the vastness of the entire range of wave lengths of radiant energy, by supposing the visible rays to occupy the space of one foot, then he says "the entire spectrum would be several million miles in length".

Taking the various waves from the longest known to the shortest, we commence with the Hertzian or wireless waves, which extend beyond 12 kilometres in length. We then pass through a long series of Infra red or heat waves until we come to the visible spectrum.

The various terms and symbols used for naming the shorter wave lengths are the micron (μ) which equals one thousandth of a milometre, the millimicron ($m\mu$) equal to one millionth of a milimetre and the Angstrom unit (\AA) equal to one ten-millionth of a milimetre.

As the Ultra Violet are among the shortest waves, it is very convenient to use the Angstrom unit when speaking of their length.

The longest rays in the visible spectrum are the red rays at 7700 A° . Next in order are the orange, yellow, green, blue, indigo, and violet. The limit of visible rays is reached at 3900 A° . Then follow the Ultra Violet.

The Ultra Violet waves can be divided into near middle and far, the far ones extending right on to X Rays and Gamma rays.

The following table gives some idea of the various wave lengths, starting at the Infra red.

Infra Red	Red	Or.	Yel.	Green	Blue	Ind.	Vio.	Ultra Vio.	X ray
								Near, middle, far	
up to 7700	- 7700-6200	- 5900-5000	- 4700-4300	- 4000-3900	- 3000	- 2000	- 5000	- 0.1	

The infra red, or dark heat waves, are absorbed by water, and warm the skin surface of the body only.

The red rays have a greater power of penetration and warm the epidermis, the dermis and superficial muscles.

As, for therapeutic purposes, we are only concerned with Ultra Violet rays ranging from 3900 A° to 1850 A° , we can subdivide this region into two, calling them near and far.

The near Ultra Violet, from 3900 A° to about 2520 A° , penetrate the skin, especially the longer ones which reach a depth of 1 mm.

The far Ultra Violet do not penetrate the skin and are to a large extent absorbed by air. Below 2320 A° , they are practically all absorbed. These rays, however, although they have no penetrative power, have a marked bactericidal action/

action. This action commences at 2960 Å to 2100 Å, the maximum effect being between 2800 Å and 2540 Å.

Rays shorter than 2900 Å do not occur in ordinary sunlight, having been absorbed in their passage through the atmosphere, thus the abiotic rays obtained from the sun are very few, and yet those few exercise a very marked effect. It is well known how well the sun acts as a disinfectant.

The quartz mercury vapour lamp produces rays as short as 2000 Å, thus, if placed in contact as is the case, when using a Kromayer lamp, the bactericidal action is extremely powerful. Even when using an air-cooled lamp, absorption by air does not take place to a marked degree with rays over 2320 Å so we still have a large percentage of such rays. Thus any skin surface so treated becomes sterilised. It is small wonder then that this form of therapy has such a large field of utility in Dermatology.

True, the rays do not penetrate, with the exception of a few of the longer ones which have some slight penetrative power, but this local action is of great benefit in all superficial infections such as impetigo and suppurating ulcers. This local abiotic action is also enhanced by the fact that the Ultra Violet rays stimulate the skin, causing an erythema. The added flow of blood to the part in itself has some bactericidal action. Is not a hyperaemia, as produced by a Bier's bandage, applied with this principle?

Eidinow, in his paper entitled "Some observations on the Dosage of Ultra Violet Light (The Lancet Aug. 15th 1925) describes a method of dosage in which he uses the power of the abiotic ^{rays} to kill infusoria placed in a shallow water-cooled quartz cell. Given a standard source of Ultra Violet, he calls the time taken to kill the infusoria a Ki unit. A bleaching standard solution of acetone methylene blue is compared to this unit. To bleach the standard solution from shade No.8 to shade No.9 it takes two or three K i units under the mercury vapour and four or five under the carbon arc.

Generally speaking twice the time taken to kill the infusoria will produce a mild erythema on a normal white skin.

Before going on to discuss the action of Ultra Violet Rays, it would be well to describe the reaction of the skin after irradiation.

After a latent period varying from an hour or two to about 8 hours an erythema begins to appear over the parts irradiated. This latent period varies very much in different individuals and may come on almost at once. The erythema also varies very much, according to the dose, the part of the body irradiated and the individual. The parts of the body which are most sensitive to light are the parts which are usually covered, except perhaps the face, which sometimes gives a marked reaction. The exposed parts will take/

take a much stronger dose before any reaction is obtained.

Especially sensitive are the abdomen, chest, flexor aspects of arms and popliteal spaces. Generally speaking the flexor aspects are always more sensitive than the extensor.

Blondes are more susceptible to the rays than brunettes, that is, they react more strongly but do not pigment so readily. People with red hair react the most strongly of all and some will not pigment at all, they only freckle. This type is said to derive the least benefit from the rays. According to Rollier pigmentation is necessary before any deep seated therapeutic action can take place. Again, the erythema varies according to the state of the skin.

Generally speaking a normal skin reacts more readily than a diseased one. This is well seen in cases of Leucoderma, ⁱⁿ which, although a severe reaction is obtained round the lesion, on the depigmented area, no reaction takes place. This is all the more remarkable as pigmentation is said to protect the skin and prevent severe reactions. I have also noticed that an area that has been badly bruised will not react to light. I administered Ultra Violet Light to an arm that had been broken and showed considerable ecchymoses and swelling. I commenced with a small dose and there was no reaction whatever, the next dose given after a week's interval was consequently increased. There was still no reaction. The patient did not come for treatment/

ment again for about a fortnight, and by that time some of the ecchymoses had disappeared although there was still a large bruised area in the centre of the part. The dose given was the same as the previous one, i.e. a strong one, and a violent reaction occurred in the parts which had returned to normal, while the bruised area in the very centre of the irradiated part remained unaffected. The reverse has been pointed out by Dr. Sibley. Old standing specific cases react violently to very small doses, and if Syphilis is suspected, the first dose of light should be given with great caution.

So much for the erythema. The length of time during which it persists varies with the intensity, it may be transient, it may last for one or two days. If the reaction is very severe, the hyperaemia produces sufficient stasis of the circulation to cause an exudation and the result is a blister. After the erythema has faded desquamation generally follows. This again varies according to the severity of the reaction, a mild erythema may not be followed by desquamation at all, but there is generally a little peeling, if only in such fine flakes that it is described as a "roughness". After a severe reaction the skin may come off in large flakes.

Pigmentation is the last stage and is caused mainly by wave lengths between 3300 A and 2900. Pigment is formed in the basal-celled layer of the epidermis, melanin granules being deposited in the cells round the nuclei/

nuclei. These are supposed to form a screen or protection from over dosage of the Ultra Violet rays. Certain it is that pigmented areas are much less sensitive to actual light, the exposed surfaces of the body standing much larger doses than the covered parts.

From this it would seem that in order to get the best therapeutic action, care should be taken not to get a marked degree of pigmentation. But this is a direct contradiction to Rollier's view. He has observed that deep pigmentation is a favourable sign. The true nature of melanin has not yet been established, but "Block (cited from Russell & Russell Ultra Violet Radiation & Actinotherapy) proved the presence of an enzyme in its production, which he termed "Dopa Oxydase". He made use of a substance dioxyphenylamine, which he brought into contact with the skin. A brown coloration resulted, which was granular and appeared in the basal cells of the epidermis. This reaction did not take place in an albino skin, and was activated by all agents causing pigmentation especially light". Possibly the melanin in its turn has some chemical action on the rays, converting them into longer rays with greater power of penetration, which may account for Rollier's observation.

Dr. Knowsley Sibley (Treatment of diseases of the skin by Ultra Violet Rays: "Medical Press and Circular" Nov.4th 1925) has made mention of the interesting behaviour of Haemoglobin, chlorophyll, haematoporphyrin, pigment of skin, biliary pigment and other fluorescent colouring matter/

matter such as eosin,^{me} theylene blue, etc.

Mice, when injected with haematophorphyrin and exposed to sunlight quickly die from severe oedema, whereas they show no injury if kept in the dark. He also points out that haemoglobin is a derivative of haematophorphyrin and that traces are found even in normal urine especially in fever, sulphonal poisoning and hydroa aestivalis^e (recurrent summer eruption).

As can be seen above he includes "pigment of skin" in this category, so that there seems to be little doubt that tanning in some way enhances the effect of Ultra Violet rays in the deeper tissues, although it seems to protect the epidermis itself.

Peacock also points out in his paper ("Quantitative data in tissue reactions to Ultra Violet radiations" The Lancet Aug. 22nd 1925) that the skin is fluorescent although he disagrees as regards pigment, and in his conclusions, considers that this fluorescence acts in the same way as pigment, in protecting the skin from excessive radiation, the only difference being that this protection commences from the first dose, but he does not consider that pigmentation or fluorescence enhances the therapeutic result. Rather does he think that it should be avoided if possible, as it hinders the penetration of the rays.

"Hoffman" (cited from Ultra Violet Ray Therapy in peritoneal and glandular tuberculosis of children by Oerstenberger and Wahl - Journal of American Medical Association) suggests that the skin is possibly the most important/

important seat for the production of immune bodies. In this connection, he points out that many infectious diseases that involve the skin, such as scarlet fever, variola, and chicken pox produce a more or less permanent immunity whereas, in infections such as diphtheria, pneumonia and typhoid fever, the opposite is likely to be true".

Russell & Russell point out that pigment increases the immunity of the skin, among other instances, they quote that deeply pigmented areas do not respond to vaccination unless the skin is actually cut through instead of the usual scarification. Thus it would appear that pigmentation is beneficial in several ways. Mention was made above of the local bactericidal action of Ultra Violet rays. The general action is now to be considered. Observers have shown that the bactericidal power of the blood is increased after exposure to light and that it remains increased for a few hours after irradiation and then falls to normal.

Sonne found a rise in the anti-bacterial property of the blood after irradiation by testing its effect on typhoid agglutinins and by its increased resistance to diphtheria toxin. Palmieri irradiated blood from patients suffering from tuberculosis of the skin. After 15 mins. there was an increase of the phagocytic index, and later after 30 mins. there was a decrease. This was when the whole blood was treated. The action of the rays was enhanced by the addition of red and yellow rays. Irradiation of the leucocytes alone inhibited phagocytosis.

R. G. Benneman^r has shown that an overdose of light produces a rise in the haemo-bactericidal power which later falls below normal and remains below for some time, before gradually rising to normal.

This was found to be accompanied by other phenomena, notably an increase in the sedimentation of blood corpuscles which is taken to indicate a phase of diminished resistance.

Dr. Paige Arnold has commented upon a certain train of symptoms noticed in some individuals who seem to be unduly sensitive to light. After an apparently normal dose producing no marked erythema, these individuals feel depressed instead of exhilarated. Following a latent period of two to four hours, there is headache, chilliness, pain in back, conjunctival irritation, nausea and general depression. There may be diarrhoea. The next day there is a general lassitude which gradually passes off. He states that the condition appears in one out of twenty-five patients so treated. This seems a high figure. No such cases have been observed after light treatment at St. John's Hospital, although these cases undoubtedly do occur. It would be interesting to observe whether these cases are in any way analogous to those effects of overdosage observed by R. G. Benneman^r.

Ultra Violet rays are now regarded as being almost a specific cure for rickets, and lack of sunlight, if combined with certain other factors such as a deficiency in Vitamine A, are looked upon as factors in the etiology of the disease.

Rickets is characterised by a disturbance in the mineral metabolism which is manifested by an alteration in the structure of the bones and a diminution of the inorganic phosphorus or of the calcium of the blood. Both of these abnormal states are rectified when the infant or animal is exposed to sunlight or to Ultra Violet Radiations from an artificial source. How this remarkable action is brought about remains to be determined.

Experiments have been performed showing that rats placed on a rickets producing diet do not contract rickets if they are given a small portion of the irradiated skin of some animal. Now the skin is especially rich in cholesterol, and Hess thinks that the anti-rachitic factor, which obviously must have been produced in the irradiated skin may be due to activation of the cholesterol. This same effect may be produced in the test tubes apart from any bodily functions and is therefore due to some definite chemical change.

MacKay & Shaw (Foodstuffs irradiated with Ultra Violet Rays "Effect on Ricket: child" B.M.J. Aug.22nd 1925) point out that feeding with irradiated foodstuffs is sufficient to bring about the rapid healing of rickets. The cure depends on the power of light to produce a certain substance, the anti-rachitic factor. It is possible to boil these irradiated foodstuffs without losing this property.

Recently Grant and Gates have reported that when rabbits are exposed to the Ultra Violet rays of the mercury vapour lamp, their parathyroids regularly hypertrophy.

The effect of parathyroid on calcium metabolism is well known and it is also known that Ultra Violet Rays cause an increase in the calcium content of the blood. It has been suggested that the irritation brought about by injury to the superficial cells of the epidermis causes an increased production of the internal secretion of the suprarenal, thyroid, parathyroid, ovaries, etc. which stimulate calcium metabolism.

Bearing these facts in mind it seems possible that the chemical change brought about in the cholesterol in the skin, mentioned when discussing pigmentation, may be the factor stimulating the endocrines. The whole subject is of deep interest.

Cod-liver oil, which has always been regarded as a specific in rickets and exceedingly useful in tuberculosis, has been found to emit Ultra Violet Rays when oxidised. Nowadays when so many diseases are being regarded as being due to a calcium deficiency, from rickets to simple diseases such as acne and chilblains, a good many of the beneficial results obtained from actinotherapy may perhaps be explained by the above factors. Adding to the increased calcium metabolism the increase in the haemo-bactericidal power, the increase in lymphocytes, the local reactions following hyperaemia and local antiseptics, it will at once be seen that these rays acting in so many ways, many of which are completely unexplained, are bound to take effect in a very large number of different diseases and we have ample proof from many sources that such is the case.

Baly (Journal of State Medicine Vol.33 No.8, 1925) has studied the reactions when Ultra Violet Rays act upon a mixture of carbon dioxide, water, ammonia, and nitrites, and the results of his experiments are very interesting. It appears he has found under the influence of light these substances undergo chemical changes which represent the first stages of the synthesis of alkaloids and proteins by plants. The synthesis of carbohydrates, alkaloids and proteins from simple inorganic materials has long remained a mystery, and as light is the solution of this problem, one wonders if it will eventually solve other age-long problems. It seems to act as a catalytic agent, enabling chemical actions to take place between various substances, which would otherwise take place very slowly, if at all.

Another very important question which has been raised among workers in this branch of therapy is whether the prolonged use of light will produce ultimate changes in the tissues, as has been observed with X Rays. In other words, is there any danger of producing a chronic dermatitis with a tendency to malignant change? Many observers claim that when such a condition has been produced by prolonged use of X rays, Ultra Violet Rays will do much to improve it.

MacKee & Andrews (The Ultra Violet Ray as a prophylactic against radio dermatitis - Journal of the American Medical Association, Nov.28th 1925) cited how Becker in 1915 and Sampson in 1922 had announced that Ultra Violet Ray, both before and after X ray irradiation, allowed a much larger dose of X Ray to be administered before a radio dermatitis is set up.

After observations and experiments on a large number of cases they (MacKee & Andrews) came to the following conclusions:-

1. Actinotherapy is of some value in the treatment of chronic ulcers and telangictas, ~~is~~ caused by Rontgen Rays or Radium.
2. Vigorous actinotherapy, resulting in acute reaction at or near the time of Rontgenization, may enhance the result of the latter.
3. Tanning of the skin by actinotherapy does not materially increase toleration for Roentgen Rays or Radium.
4. Preliminary generalised actinotherapy, even when continued for a long time does not appear materially to decrease radio sensitiveness.
5. It is possible to administer several, or many times, the standard erythema dose of Roentgen Rays to normal human skin without effecting more than a mild visible reaction. Ignorance of this fact may account for the erroneous assumption that actinotherapy is prophylactic against Roentgen Rays and radium injuries.
6. In our opinion, the Ultra Violet ray, regardless of how employed, is of no practical value as a prophylactic against acute or chronic radio dermatitis.
7. In our opinion, a combination of the Ultra Violet Ray and the Roentgen Ray is more likely to be followed by sequelae such as telangiectasis than when the Roentgen Ray alone is employed.

Professor Dubreuilh of Bordeaux (Chronic sunburn & Epithelioma) has made a study of the ultimate effects of prolonged exposure to Ultra Violet Rays. He has come to the conclusion that what is known as Keratosis Senilis is really Keratosis Solaris and due to constant exposure to sunlight or Ultra Violet. He draws comparison between the immediate and remote effects of heat, Ultra Violet and X rays. In heat the preliminary erythema comes on at once and very few instances are quoted of any harmful remote results. In Ultra Violet there is a latent period of a few hours before the preliminary erythema and in X rays a few days. Remote effects of X rays come on after a few years, Ultra Violet after many years and then only after very prolonged exposures, but he looks upon all three as having a distinct relationship to one another. Time alone will show if any of our present modes of actinotherapy will produce remote harmful effects.

SECTION IV.

APPARATUS AND TECHNIQUE OF TREATMENT.

Ultra Violet Rays can be obtained from two main sources:-

1. Nature or natural sunlight,
2. Artificial means, usually some form of electric arc lamp.

One would, of course, expect the natural means to be the better and consequently the most beneficial, and in the case of Tubercular patients, undergoing treatment on the mountains in Switzerland, where the air is fresh, the climate dry and the sun, not only rich in Ultra Violet Rays, but also to be depended on, it is most certainly to be preferred to treatment by artificial means in closed and airless rooms, though as far as the actual light is concerned, the artificial should be the better, as even under the most ideal conditions, a large percentage of the Ultra Violet Rays are absorbed by the atmosphere. It must be remembered that no conditions in this country are equal to those of the Alps, for the rarified atmosphere permits the maximum of Ultra Violet Rays to reach the patient, also the snow and ice serve the twofold purpose of absorbing the heat rays which are harmful and reflecting back the Ultra Violet. Water acts in the same way; thus, in this country, the seaside is the most suitable for heliotherapy, but then only for a few months in the year is there sufficient sun and even that small supply is unreliable.

It is therefore very necessary for us to fall back on artificial sources, the only disadvantage being the lack of pure fresh air, but in spite of this, excellent results can be obtained.

Many and varied are the lamps on the market for the production of Ultra Violet Rays, but they can all be divided into three main groups.

1. The Open Arc
2. The Quartz Mercury Vapour or closed arc
3. The Incandescent Lamp.

Of these three groups, the first two are the most useful.

Incandescent lamps are rich in infra red and visible rays, and as such are used therapeutically for giving Radiant Heat Baths, in cases of neuralgia, neuritis, and rheumatic conditions, but the amount of Ultra Violet Rays given off is infinitesimal in the case of the ordinary lamp, as the small quantity generated, about 1% are almost completely cut off by the glass bulb. If, however, the glass bulb is replaced by quartz, it is possible to obtain a very weak supply of Ultra Violet Rays from such a source, but in order to be beneficial, the exposure would have to be very long, especially as owing to the heat waves produced, the lamps could not be brought into close contact with the patient's body. All arc lamps, whether open or closed, are produced by passing an electric current from one terminal to/

to another. This produces an intense illumination composed of visible rays of the spectrum, especially those at the violet end and also the invisible or Ultra Violet Rays.

1. The open arc lamps usually have their electrodes composed of carbon or tungsten, either pure or alloyed with other metals. Other metals in their pure state have also been used, e.g. iron (used by Professor Bang), copper, silicon.

2. The Mercury Vapour or closed arc may be divided into:-

- (a) Water cooled, of which the Kropmeyer is a type.
- (b) Air cooled, which may again be subdivided into three.

Those which have their arcs struck in vacuo, in argon or at atmospheric pressure.

Of these three main types, i.e.:-

- 1. Carbon arc
- 2. Tungsten arc
- 3. Mercury Vapour

it is extremely difficult to place one before the other as regards their utility. They all have their advantages and disadvantages. The Carbon Arc has a spectrum which differs very little from natural sunlight and is therefore perhaps to be preferred, especially in general irradiations where a tonic and stimulative action is required, but it needs a long exposure to produce an erythema and this is a great disadvantage, except in hospitals where a number of patients may be treated at the same time.

The Tungsten arc lamp is extremely rich in Ultra Violet Rays and gives excellent results, but it gives off unpleasant/

unpleasant fumes when burning and the Tungsten electrodes often need replacing and are costly.

The Mercury Vapour type is very useful, especially as it consumes a small amount of current, but against this the burner is very fragile and needs renewing fairly often as the mercury becomes deposited on the quartz inside the tube and cuts off the Ultra Violet Rays. A great advantage with the majority is that they can be used either open for general irradiations or when treating a large area of skin locally, or closed for smaller local applications. Also they can be fitted with quartz applications and are thus very useful in treating certain skin diseases, and as this thesis is chiefly concerned with Ultra Violet radiation in relation to such diseases, such a lamp is undoubtedly one of the most useful, and the description which follows is of the lamp and the technique used in treatment at St. John's Hospital for diseases of the skin, Leicester Square.

The Lamp used is the "Original Hanau" type of air-cooled Mercury Vapour with the arc struck in vacuo. The burner consists of a hollow tube of quartz at each end of which at right angles, but lying in the horizontal plane, are two chambers of quartz connected with the central tube and containing mercury. These are the poles. Around these mercury poles are metal coolers, which by heat regulation control the distribution of the mercury in the lamp.

The conductors are sealed into the quartz tube and/

and the mercury vapour in the vacuum of the tube, carries the current from one pole to the other.

The burner is fitted into the stand by means of sockets attached to the coolers, and in order to light the lamp, the current is first switched on and the lamp tilted by means of a handle attached to the stand. This causes the mercury to run across the tube from one pole to the other and so strikes the arc. The burner is then returned to the horizontal and the mercury returns to its place, but the vapour produced allows the current to continue passing across the tube. The stand is fitted on wheels so that it is easily moveable and the burner is enclosed in an aluminium hood which can be opened or closed for general or local treatments and the whole hood can be raised or lowered and swung from side to side as desired. When closed the aperture can be altered by means of diaphragms of four different sizes, so as to allow large or small areas to receive local treatment, without necessitating the covering of the surrounding parts. By means of a special adaptor the various quartz applicators supplied with the Krohmer water-cooled mercury vapour lamp can be fitted to this aperture, so that it is possible to treat naevi, lupus, etc. with pressure on the part as in the case of the Krohmer lamp. It is not, however, so powerful as the Krohmer and the exposure needs to be longer in order to produce the same results.

The advantage of pressure is that it exsanguinates the/

the part and thus allows a greater degree of penetration of the rays.

The lamp can be obtained to suit varying voltages and can be made for a direct or alternating current, and thus can be fitted on to the ordinary electrical supply. Care must be taken not to reverse the polarity as this ruins the burner. At a voltage of 200 - 240 D.C. the normal amperage is 3.5 to 4. When first lighted the starting amperage is about 15, but this drops to normal in 5 - 10 min. The voltage across the burner is about 160.

With such a lamp the average erythema dose in an individual unused to light treatment is 3 minutes at a distance of 20-24 inches, or 2 min. at a distance of 18 inches.

It must be remembered that no two individuals are alike and that some parts of the body, notably the chest and abdomen, axillae, popliteal spaces and flexor aspects of the arm, are more sensitive. It is as well then, to start patients at a distance of 20-24 inches for three minutes and to watch the reaction carefully, and to increase the dose, either by lengthening the time of exposure or decreasing the distance. It should be noted that when the distance is decreased the strength of the dose is increased in proportion to the square of the distance, e.g. if the distance is decreased from 20 in. to 10 in., the dose is not twice but four times as great.

With regard to the quartz applicators mentioned above, these are very useful to promote a greater power of penetration. The ordinary rays possess very little such power, some of them none at all and even the longer ones only as far as the deeper layers of the skin, where they are absorbed by the capillaries. If, however, the blood is expressed from the part by direct pressure with a quartz applicator, the rays are able to penetrate a little deeper. This form of treatment is particularly useful in cases of Lupus vulgaris, also when treating naevi, the well-known "port wine stain" becomes considerably paler when so treated. In these cases the aim is to produce a blister, not a mere erythema and thus a very much stronger dose is needed.

The quartz applicators are supplied in various shapes and sizes. Long narrow rods are very useful for inserting inside the ear or up the nostril and rays can be directed to the back of the throat by such means. The length of the rods should be carefully measured and 6 inches (i.e. the distance from the burner to the aperture on which the applicator is fixed) is added on and this gives the distance of the patient from the burner. For instance, if the quartz is 4 in. long, $4 + 6 = 10$ in., i.e. the patient is 10 in. from the lamp.

The initial dose in such a case would probably be 10 inches 1 min. but as a blistering dose is often aimed at, 10 inches 3 min. might be the commencing dose.

A very useful applicator is one made as a lens, i.e. the base of the quartz is three times larger than the apex. It follows then as the light runs along the quartz there will be a concentration of rays at the apex which increases the strength of the dose by three. Thus, in patients who have had a series of such treatments and are very resistant to light, the time taken to produce a blister is considerably lessened. Before commencing treatment any ointment scales or crusts are removed by acetone or ether and the patient is instructed never to apply the ointment just before, or even the same day as his treatment. Even a very thin layer of grease will almost completely cut out the rays.

If the rays are being directed on to the face, he is given goggles to shield the eyes, otherwise a severe conjunctivitis may be set up. If the lesion is not near the face, this precaution is hardly necessary as in this type of lamp the aluminium hood forms a good shield. If the lesion be very near the eye so that the goggles, if worn, would screen it from the light, the rays are directed on to the lesions through the smallest aperture and the patient instructed to keep his eyes tightly closed. A dark room minute clock is used to ensure accuracy as regards time and a note is made of every treatment given.

As a rule the treatments are given weekly though in some cases bi-weekly treatments may be suitable. A second/

second treatment should not be given until the reaction from the first has died down. The doses are carefully regulated according to the reaction aimed at, and the one produced at every previous treatment.

The cases mentioned in the following section have all been treated according to the technique and with the mercury vapour lamp just described, this being the only type of lamp in use at the present time at St. John's Hospital.

SECTION V.PERSONAL EXPERIENCES AND NOTES OF CASES.ACNE VULGARIS.

Ultra Violet Rays, producing as they do a local irritation with hyperaemia combined with a superficial bactericidal action, give very good results in the treatment of this condition. Internal remedies for any general disturbance such as constipation, should be given at the same time, especially when the irradiation is local. The dose should always be strong enough to produce an erythema followed by some desquamation and the treatment given weekly. It is an advantage to treat as large an area as possible including a large dose to the scalp. Most cases improve considerably and the results obtained, especially in the pustular type seem to be as satisfactory as those produced by X rays. Also they have the advantage of being far less dangerous, and if necessary can be given for some considerable time. As previously stated the severe pustular type does exceedingly well with this treatment and two such cases are described below, in one of which vaccine therapy had been tried with no result.

CASE 1.

W.A.R. Male. Age 17. Single.

This patient came up in February 1925 with a severe pustular acne covering the whole of his face and forehead. The condition had persisted for about a year. Previously he had been given four injections of colloidal manganese - this produced no result. On the 25th February 1925 he was given a sulphur lotion and sulphur internally and ordered Ultra Violet Light. He has been given 21 weekly treatments with the lamp open and the rays falling directly on to the face. The first treatment was given at a distance of 16 inches for two minutes, and this has been gradually increased to a distance of 9 inches for 6 minutes. When necessary the specially large pustules were opened with the ordinary negative electrolysis needle and the pus expressed, before the irradiation was given. Of late this has not been necessary.

He is now in a much better condition. There are very few actual pustules although he has still small acne spots and his face is of course very much scarred. He is still undergoing treatment, but at longer intervals.

CASE II.

F.G. Female. Age 20. Single.

This patient was first admitted in April 1924. She had a very severe pustular acne of two years duration which extended over the face and forehead. She was given sulphur in the form of a lotion and also internally. She had three applications of X rays, $1/3$ pastille dose each time. This had very little result. In May she had two injections of collosol manganese, 0.5 and 1 cc. respectively. This improved the condition slightly and was repeated again in July, three injections being given this time. In June she started a course of vaccines with no result and it was discontinued. She was first put under light treatment in September 1924, and has had 38 treatments at weekly intervals. The light was given through the largest diaphragm and the rays directed first on to one cheek and then the other. Her first dose was at a distance of 18 inches for two minutes and her last 6 inches for 3.5 minutes. Especially large pustules were opened with the negative electrolysis needle. She is now very much better. The pustular condition having almost completely cleared up. She began to improve as soon as she was put on to light whereas X rays, vaccine therapy and manganese injections gave very poor results.

ADENOMA SEBACEUM.

This condition is well known to be very resistant to all forms of treatment. Separate papules may be destroyed by the electrolysis needle but it is very tedious and apt to produce scarring. The two cases which follow are of special interest as they have undoubtedly improved under Ultra Violet Rays. The papules seem fewer and those which remain are very much smaller and flatter. To obtain a good result it is necessary to produce a fairly severe reaction with a good deal of desquamation but for some obscure/

obscure reason it seems these cases are extraordinarily resistant to Light and need very strong doses in order to get the desired effect.

CASE I.

R.F. Male. Aged 8.

This patient came up first in October 1925 with typical neoplastic papules extending over his face, especially thick over the nose and cheek bones. He also had the usual naevoid growths on the sacral region. There was no evidence of any mental defect. The condition had existed for three years. He was given lot. calaminae and put on to Ultra Violet Light. The first dose was given with the lamp open at a distance of 14 inches for two minutes. He had only six such treatments, the last being 6 inches two minutes. He was then given blistering doses by pressure through the quartz lens which is 10 inches distant for three minutes. He had five of these treatments and has distinctly improved. He is still undergoing treatment.

CASE II.

E.H. Male. Aged 9.

This patient came up first in 1923. He had typical lesions on his face and also naevoid growth on his sacrum. He is a nervous child but not mentally dull - there was no history of fits. From 1923 - 24 he was treated with the electrolysis needle. These destroyed the individual papules but the patient was very nervous and would allow very few to be done at a sitting. In January 1925 he was given Ultra Violet Light with the lamp open at a distance of 18 inches for 2 minutes. He had 18 such treatments, the last being 6 inches 4 mins. He had then 7 doses given through the quartz lens which is 10 inches distance. The first dose was for 1 min. and the last for 6 mins. He is very resistant to light and, although these doses were given with the object of blistering, such a reaction was rarely obtained. However he is very much improved. The lesions are far smaller. He is still undergoing treatment.

ALOPECIA.

The stimulating action of Ultra Violet Rays is exceedingly useful in all forms of Alopecia and cases of Alopecia Areata which have gone on to Totalis and proved very stubborn under many forms of treatment have improved under light. The treatment of general Alopecia is not so successful as that of Areata but this always is the case no matter what treatment is employed, nevertheless these cases do improve and the loss of hair is often checked. The increased flow of blood through the scalp improves the nutrition and consequently improves the hair growth. The difficulty is to get the rays on to the scalp. It is of course easy in an Areata or Totalis and also in general Alopecia in the male sex where there is a bald area on the vertex, but when the hair is just generally thin it is extremely difficult even after prolonged exposures to get any reaction and in order to obtain good results one wishes to produce a distinct erythema followed by desquamation.

CASE I.

H.B. Female. Aged 15.

This patient first came up in April 1925. She gave a history of pneumonia when six months old, which was followed by the loss of all her hair, it had never grown since. To commence with she was given a stimulating lotion containing cantharides with no result. From January 1924 - March 1925 she was ionized with zinc sulphate. Under this treatment the hair commenced to grow a little and then came out again. In March 1925 she was given her first dose of Ultra Violet Light. The rays were given to the scalp with the lamp open at a distance of 16 inches for 2 mins. She had 23 doses at weekly intervals omitting August and the last was given at a distance of 8 inches for 4 mins. She has now a good growth of hair all over the head about 1 inch in length. The hair appears to be strong and shows no sign of falling.

CASE II.

A.E.H. Male. Aged 40. Married.

This patient first came up in January 1922 with commencing Alopecia in the beard region. This gradually spread/

spread in patches until the summer of 1923 when he was completely bald. He was given a stimulating cantharides lotion and high frequency. Under this treatment the hair grew a little but had no strength and came out easily. In September 1925 he commenced light treatment. The light was given with the lamp open and the rays shining directly on the scalp, the first dose being at a distance of 14 inches 2 mins. The last 6 inches 4 mins. In all he has had 16 treatments. He has now a strong vigorous growth all over the head, the down there previously having taken on new strength. He was even thinking of having a hair cut.

CASE III.

E.E. Female. Age 20. Single.

This patient came up first in July 1925 with a small patch on the vertex about the size of half a crown. It had been present only 14 days. Microscopic examination revealed no fungi but the typical Areata stump. As she was a Seborrhoeic subject she was given a sulphur lotion. The improvement was slight. In November 1925 she was given her first treatment of Ultra Violet light. The lamp was open and the rays directed on to the scalp, care being taken that no hair covered the patch, and the treatments were given weekly. The first dose was a distance of 14 inches for 2 mins. and the last 7 inches for 4 mins. She has had 11 treatments and has now discontinued them. The hair is now growing very well, the progress being particularly marked since she was put on to light. The hair is now about 1 inch in length and shows no tendency to come out.

CASE IV.

E.T. Female. Aged 35.

This patient came up first in November 1925. The Alopecia Areata from which she was suffering had first commenced four years ago and had grown steadily worse for two years when she was completely bald. The hair had grown in places but was very poor and there has always been a tendency for the new hair to come out. She has been put on to Ultra Violet Light. The first treatment was given with the lamp open at a distance of 10 inches for 2 mins. So far she has only had 5 treatments, the last being 6 inches for 3 mins. She is already beginning to show signs of improvement.

ERYTHEMA MULTIFORME BULLOSA.

For superficial septic lesions combined with general debility such as the case described below, Ultra Violet Rays are an excellent form of treatment, having bactericidal properties and general tonic action and probably act by raising the calcium metabolism. It is true this disease runs a definite course and is generally considered to be self limited, but this particular case was extremely severe and continued to get steadily worse under various forms of treatment until Ultra Violet light was tried and the marked improvement which followed seemed worthy of note.

CASE.

A.B. Female. Aged 26. Single.

This patient was first examined in November 1925. She had a very extensive and severe bullous eruption accompanied by no marked symptoms, which extended all over the body especially marked on the neck, axillae, bend of the elbows, groins, inner thighs and popliteal spaces. The bullae were very large, some as big as half a crown, and were very septic. The patient had been in a very run down state before the appearance of the rash. A culture was taken from the contents of a recent bulla and was reported to be a pure culture of staphylococcus aureus. The lesions had grown steadily worse in spite of ointments and dusting powders prescribed by her doctor. It was decided to give her Ultra Violet Light. She was also given a mild sulphur lotion with which to bathe the parts, followed by a dusting powder, pulv ac. bor. co. Sulphur internally (Crookes collosol sulphur 2 drams in a tumbler of water every morning before breakfast) and weak ammoniated mercury ointment. Also 3 injections of manganese butyrate 1 c.c each time, but her main treatment has been light. In all she has had 14 treatments given with the lamp open to the whole of her body, the first dose being at a distance of 20 inches for 3 mins. This produced a very severe reaction and for a while we had to proceed cautiously, but by her last treatment she was taking 9 inches 3 mins. and the reaction was only slight. She commenced to improve at once, the bullae was smaller and less septic and for the last four weeks she has had no fresh lesions. Her body is now perfectly clear except for a little staining under the skin, which is fading nicely. She herself states that she has not felt so well for years as she does since this treatment.

ERYTHEMA INDURATUM.

The beneficial effects of light on tuberculosis are well known. This disease being a tuberculide responds extremely well to light treatment. These lesions always clear up quickly under hospital regime and rest in bed, but when light is given they heal up while the patient is still going about, a great advantage to many, and by improving the general condition, the likelihood of recurrence is considerably lessened. As large an area should be treated as possible and an ordinary erythema dose given each time.

CASE I.

A.P. Female. Aged 18. Single.

This patient first came up in April 1925. She was not a bad case, there was no ulceration but she had hard lumps in the calves and a marked sluggish circulation which had appeared for the last three winters.

She was given a prescription for her general condition ac. hydrochlor.dil.m xv. sod. sulph drams $\frac{1}{2}$ aq. ad. oz. $\frac{1}{2}$ otherwise light has been her sole treatment. Her first dose was given with the lamp open at a distance of 18 ins. for 3 mins. to legs and thighs, also to the shoulders. She had 13 treatments, the last at 6 ins. for 5 mins. was given in October 1925. She had then no sign of any subcutaneous swellings and all discolouration of the legs had disappeared.

CASE II.

E.M. Female. Aged 15.

This patient was a bad case with marked ulceration. She was treated by light only and given her first dose in October 1925 with the lamp open and the rays directed first on to the anterior legs and then to the posterior. She had 20 weekly treatments and the dose has been gradually increased and the last given on the 23rd February 1926 was at 7 ins. for 4 mins.

She has very much improved and has been able to keep about all the time. The legs are now healed and not painful but she is still undergoing treatment to guard against a return.

FURUNCULOSIS.

This condition is characterised by a local infection accompanied by a general lowered resistance. In giving light therefore the larger the surface treated the better, and if general light baths can be given, quite apart and distinct from local treatment, it is all to the good. Locally an erythema dose should be given and in the early stages before the formation of pus it will abort the process. After pus has formed the lesion should be opened, if large by excision and if small a negative electrolysis needle suffices. Irradiation should follow and will hasten the process of recovery. In the absence of general light baths injections of manganese butyrate or collosol manganese and vaccines should be given at the same time.

CASE.

C.C. Male. Aged 68. Married.

This patient first came up in November 1924. He was suffering from furunculosis which only attacked the face and neck. He was given sulphur internally (Crookes collosol sulphur 2 drms in water every morning), also sulphur lotion. Previously he had been treated with collosol manganese and vaccines with no result. He was given light to the face and scalp in different areas through the largest diaphragm. He had weekly treatments over a period of six months. His first dose was given at 18 ins. for 3 mins. and the last 8 ins. for 6 mins. At the commencement any large lesions were opened and the pus gently drawn out by means of a Bier's suction cup before irradiation took place. The light had the effect of healing the individual boils very quickly and, if given at the commencement before pus had formed, it would abort them. Gradually the boils became less frequent and very much less severe and at the end of the six months he appeared to be cured.

HERPES ZOSTER.

In the early and acute stages of Herpes, especially Herpes Zoster, Ultra Violet Rays do much to relieve the pain, dry up the individual vesicles and prevent scarring. Later in cases which are followed by obstinate and severe neuralgia erythema doses give considerable relief even in longstanding cases.

CASE.

.H. Female. Aged 63. Single.

When first seen on December 3rd 1925 this patient gave/

gave a history of a very bad attack of left sided frontal herpes zoster. A good deal of scarring remained accompanied by severe neuralgia and the eye was very injected. The affected area was somewhat anesthetic. This attack had occurred a year ago. The patient was given calamine lotion to every ounce of which m.5 of carbolic acid had been added, also zinci valerian gr.1 t.i.d. She was given Ultra Violet light through the largest diaphragm at a distance of 18 inches for $2\frac{1}{2}$ mins. and the last dose was 12 ins. 3 mins. She only had six treatments and the neuralgia was much less severe. Unfortunately she had to go away and could not continue.

IMPETIGO CONTAGIOSA AND SYCOSIS.

These two conditions may be taken together, although Impetigo is primarily a streptococcal infection. There is, however, in a large majority of cases a super added staphylococcal infection, and in men a neglected impetigo of the beard region often goes on to Sycosis, which is a follicular condition caused by the staphylo ~~coccus~~. Impetigo being a superficial infection is eminently suitable for treatment by Ultra Violet Rays. All crusts should be removed before irradiation as they prevent the rays reaching the infected surface.

Doubtless treatment with the Krokmeier lamp would be ideal as the percentage of bactericidal rays which reach the skin would be so much higher and in Sycosis where the infection is deeper this would be specially useful as it would also afford a greater degree of penetration.

Provided, however, a fairly severe erythema is produced the inflammation with the added flow of blood to the part together with the bactericidal rays which reach the surface very good results can be obtained with the ordinary mercury vapour lamp.

CASE I.

F.L. Female. Age 36. Single.

This patient first came up in May 1925. Her chin was affected with Impetigo of about one week's duration. There was some adenitis, the submaxillary gland being particularly affected. She was given a mild sulphur lotion with which to bathe off the crusts and weak ammoniated mercury ointment, also X rays - $\frac{1}{3}$ of a pastille dose - was given twice to the submaxillary gland - otherwise light was her main treatment. She commenced with a dose given through the largest diaphragm at 20 ins. for 2.5 mins. She had 12 treatments altogether although the impetigo itself healed very rapidly, the remaining treatments were for the adenitis. Her last dose was at a distance of 16 ins. for 2 mins. Both the impetigo and the enlarged gland were quite cured at the end of the 12 treatments which were given at bi-weekly intervals.

CASE II.

H.S. Male. Age 21. Single.

This case is particularly notable for the rapidity of its cure. The patient came up in November 1925 with an impetiginous condition of his face and chin which persisted for 14 days. He gave a history of a "foul shave" and the condition was rather severe and it was feared it was a commencing sycosis. He was given weak ammoniated mercury ointment and Ultra Violet Light. He only had three treatments given through the largest diaphragm to three areas (right and left face and chin). The first dose was 20 ins. for 3 mins. and the last at 18 ins. for 3 mins. The condition cleared up with great rapidity and he was discharged as cured.

LEUCODERMIA.

This condition has always been looked upon as being particularly resistant to treatment, at all events local treatment, for if the cause is due to some general condition such as Syphilis, it puts it in quite a different category. Any local treatment is nearly always based on the idea of producing hyperaemia, and Ultra Violet rays applied locally to the part very easily produce such a result. It is true many people complain that their condition gets worse in summer. Possibly this is only by contrast, the surrounding parts sunburn and pigment while the white patch remains untouched. As has been mentioned earlier, these patches are very resistant to light. One can produce a strong reaction round about with severe desquamation, the white patch remaining untouched. If, however, the treatment is persisted in and the light given in strong doses directly on to the affected areas, they can be induced to pigment. The pigment seems to come in from the sides, making the patches smaller, also isolated pigmented spots appear in the centre and gradually spread.

Unfortunately the notes of one case only could be obtained.

CASE I.

G.J. Female. Age 30. Married.

This patient came up first on August 13th 1924 with two large symmetrical patches of leucoderma on each side of her neck which had persisted for three years. She was given a lotion containing liq. carb. deterg. and Ultra Violet light. Her first treatment was given through the largest diaphragm at a distance of 20 ins. for 3 mins. She has had weekly treatments over a long period and the last was at a distance of 6 ins. for 3 mins. In all she has had 48 treatments. She showed the reaction described above/

above in that we were never able to get the lesion itself to desquamate. She has, however, improved, the patches are distinctly smaller and there are a good many small pigmented areas in the centre.

LUPUS VULGARIS.

Ultra Violet Light, one might almost say, made its name in the treatment of Tuberculosis, both general, surgical and in the skin, and the wonderful results obtained by Finsen, Rollier and other workers have already been mentioned. The tubercle bacillus and its surrounding inflammatory reactions lies in the deeper layers of the skin and therefore the ordinary bactericidal rays, having no power of penetration, are useless.

Some observers say that local light treatment is of no value, only general light baths should be given. Cases of lupus have been cured by this method, the diseased part having been altogether protected from the rays. By using a Krommeyer water cooled mercury lamp, light rich in bactericidal rays is brought into direct contact with the skin and pressure, by cutting out the blood which screens off the rays, allows a greater degree of penetration and it is therefore possible that a few of these rays reach the disease. But the beneficial results obtained in these cases is probably due to the severe inflammation following the heavy blistering doses which are given. This inflammation probably accounts for the good results in the cases described below, for the treatments were given through the ordinary mercury vapour lamp, whenever possible by pressure through the quartz, but not always. No general light baths were given, though as large a surface as possible was exposed to the light. Severe erythema doses were given over large areas, and blistering doses over small.

CASE I.

M.P. Female. Age 66. Married.

This patient first came up early 1924 with a hard circumscribed nodule of 45 years duration on the lower lip. The condition was first thought to be specific but did not clear up under treatment. A biopsy was then performed and the section showed it to be tubercular. She first began light treatment in September 1924 and her first dose was given through the smallest diaphragm with the rays shining on the lesion at a distance of 9 ins. for 2 mins. This was gradually increased and in February 1925 she was given treatment by pressure through the quartz lens which is 10 ins. distant from the lamp for 3 mins. The treatments had/

had been given weekly and her last up to date was through the quartz lens 10 ins. 6 mins. In all she has had 29 treatments. It is now very much improved. From being a hard nodule it is now quite soft and difficult to detect in the surrounding lip, shows no tendency to ulcerate and it is not painful.

CASE II.

P.C. Female. Aged 9.

This patient came up first on March 16th 1925 with a small patch of lupus about the size of a shilling situated on the right cheek. It was of three years' duration. Beyond weak ammoniated mercury ointment Ultra Violet has been her sole treatment. It has been given with pressure through the quartz lens at a distance of 10 ins. commencing with 3 mins. In all she has had 24 treatments and the last dose was through the lens for 4.5 mins. The patch was examined on January 22nd 1926 and appeared to be cured. No sign of granuloma could be detected and the scar left was very fine and hardly noticeable. She has been told to report after an interval in case of any recurrence.

CASE III.

V.J. Female. Aged 12.

This patient first came up in May 1925 with a patch of lupus the size of a shilling on her right cheek. The condition had persisted for 9 years. She was given lot. calaminae and Ultra Violet light. She has had 25 treatments given by pressure through the quartz lens at 10 ins. The first treatment was 4 mins. and the last 5 mins. She has also had two treatments to the whole side of her face given with the lamp open, the first at a distance of 10 ins. 2 mins. and the second 8 ins. 2 mins. One or two outstanding granulomata have been pricked from time to time with acid nitrate of mercury. The condition appears to be cured.

CASE IV.

L.E.I. Female. Aged 57. Married.

The history given by this patient was that of an abscess in the left thigh at the age of 10 which had persisted for six years. On examination she had an extensive papular non-ulcerated tuberculosis cutis extending over the left buttock, outer and inner left thigh on the upper third/

third of the left leg. She had tried many forms of treatment but the condition grew worse and she felt very weak and ill. The condition had then persisted for 8 years. Ultra Violet light was administered first in September 1924 with the lamp open and the distance 18 ins. 3 mins. She has had the treatments weekly. Practically the whole of her legs and thighs being exposed each time and has had up to date 63 treatments, the last being at a distance of 6 ins. for 11 mins. Some of the most outstanding granulomata have been pricked from time to time with acid nitrate of mercury. The condition is very much improved. In some areas notably the upper third of the inner thigh it has completely cleared up and the scarring left is very slight but everywhere the lesions are smaller and flatter and give rise to no trouble. The patient herself feels very fit and "quite different". She is still undergoing treatment. Unfortunately the areas are far too extensive for local application by quartz compressors and we have to be content with giving as heavy a general dose as the patient can stand.

CASE V.

H.O. Female. Aged 39. Married.

This patient first came up in March 1924 with a patch of lupus on her outer right arm just above the elbow. The patch was about the size of half a crown, had persisted for 10 years. She also gave a history of having had a tubercular kidney removed in October 1923. To commence with she did not come regularly and the lesion was painted with acid nitrate of mercury. In September 1924 she was given Ultra Violet light, the first 11 treatments were given at weekly intervals through the largest diaphragm, the first dose being 20 ins. for 3 mins. and the last 6 ins. 6 mins. In March 1925 the mode of application was changed and she was given the light with pressure through a flat piece of quartz 6 ins. distant from the lamp for 6 mins. She has had 16 of these treatments. She was last seen on 6th February 1926 when the condition appeared to be cured. She is still kept under observation.

CASE VI.

F.B. Female. Aged 57. Married.

This patient came up first in June 1924 with a chronic ulcerated condition situated under her chin about 3 by 2 inches. It had not the characteristic appearance of lupus and in taking her age into consideration it was thought to be specific. The Wassermann was reported negative. A second test was done after a provocative injection of novarsenobellon and this was also negative. However/

However she was given a mixture containing mercury perchloride and pot. iod. Also ung. hyd. amm. dil. No improvement followed, the condition appeared worse. Examination for fungi was also negative. Microscopic examination suggested lupus. Accordingly in May 1925 she was given light treatment, the first dose was given with the lamp open and the rays shining directly on to the lesion at a distance of 16 ins. for 2 mins. She had 26 such treatments, the last being given at a distance of 10 ins. 2 mins. She was then given the light by means of pressure on to localised areas through the 10 inch quartz lens for 4 mins. She had had 4 such treatments and is still continuing. The condition shows a remarkable improvement. It is no longer ulcerated and some areas are completely clear of granulomata, showing fine inconspicuous scar tissue. It is no longer unsightly and in time she will be completely cured.

CASE VII.

S.A. Female. Age 13. Single.

This patient first came up in June 1924. She had a fairly extensive tuberculosis cutis on the right ankle, both inner and outer and anterior. It was painted with acid nitrate of mercury, but as the patient lived some way away she did not come up again for treatment. She returned in July 1925. This time the condition had spread, the right ankle was ulcerated so that she was obliged always to wear a bandage and there was a small circular area about an inch and a half in diameter on the posterior aspect of the left ankle. This time she arranged to come up regularly for light treatment. Her first dose was given at a distance of 6 ins. for 4 mins. with the lamp open. This sounds a large initial dose but the surrounding non-infected parts were covered up after a minute or so and thus a severe reaction was obtained on the infected areas. She has had 26 treatments, the first were weekly, but just lately they have been fortnightly and the last dose was at a distance of 6 ins. for 9 mins. to the affected areas, the whole of the legs being exposed for 5 mins. without any undue reaction taking place. The condition has now entirely healed up, the patient has long ago discarded her bandages and suffers from no inconvenience. Very few granulomata can be detected under pressure from a glass slide but any outstanding ones are pricked with acid nitrate of mercury. She is still undergoing treatment at fortnightly intervals.

LYMPHANGIOMATA.

The following cases are extremely interesting. It is difficult to say why Ultra Violet Rays should have beneficial results in such cases, but the fact remains that they undoubtedly have.

Whether the rays, like X rays, have any selective action on pathological tissue, we do not know, or whether the result is merely that of improved nutrition of the skin or deep metabolic changes, has yet to be discovered. This applies also to those cases of adenoma sebaceum described earlier.



G.B. Case of Multiple Lymphangiomata.

No. 1. Before Treatment

Showing well marked pigmented & raised lesions



The Same Case. after Treatment.

The lesions are paler & flatter & do not stand out so well from the surrounding skin.



CASE I.

G.B. Female. Age 17.

This patient first came up on June 10th 1925. On her right shoulder there was a large area consisting of a number of small growths situated so close together as to form one large patch. They were not particularly hard and their general appearance was like that of multiple lymphangiomata. There ~~was~~ also one large soft tumour on the right breast and another patch similar to that on the shoulder on the left lumbar region. The condition was not painful and had come on gradually for the last ten years. A biopsy was performed with the following report,

"The epidermis is normal. Some dilatation of the lymph spaces can be seen in the corium and there is marked cellular infiltration present".

The diagnosis of lymphangiomata was accordingly made. A month later her sister L.B. aged 24 (see below) came up with a similar condition and the pathological report in this case suggested neuro-fibromata or Von Recklinghausen's disease. As they were obviously suffering from the same condition, it was doubtful which of the two diagnoses should be made. The cases were referred to the pathological sub-committee of the London Dermatological Society and it was definitely decided that they were multiple lymphangiomata. They also state that their father is suffering from a similar condition. At all events the patient has been treated solely by Ultra Violet light with the exception of calamine lotion given to make the lesions less noticeable and the result has been very satisfactory. She had 21 weekly treatments with the lamp open and the light shining directly on to the lesions. The first dose was given on June 17th 1925 at a distance of 17 ins. for 2 mins. and this has been gradually increased to 6 ins. 3 mins. She is still undergoing treatment. The lesions are now distinctly flatter and very much paler.

(See Photographs.)

CASE II.

L.B. Female. Age 24. Single.

This patient is the sister of the patient described above. She first came up on July 1st with lesions similar to the above only they were isolated and scattered over the back and chest instead of being grouped together and forming such distinct patches. The condition started 7 years ago and came on gradually. When she first came up she was given ung. sulph. c acid sal. and this was afterwards changed to a lotion containing carbolic acid and lead, otherwise her sole treatment has been Ultra Violet light. She has had 19 treatments given at weekly intervals with the lamp open. The commencing dose was at a distance of 6 ins. for 2 mins. This has gradually increased to 6 ins. 3 mins. This patient is still undergoing treatment and the lesions are distinctly smaller.

CASE III.

L.L. Female. Age 8.

This patient first came up in November 1925. The lesion was of a naevoid character situated on the right side of the ala. nasi. and was about the size of a shilling. She was at once referred to the electrical department and given Ultra Violet light. The light is given through the 10 in. quartz lens for three mins. She has had 7 treatments up to date (that is 20th February 1926) and the last one was through the 10 in. lens for 8 mins. It is distinctly improving, being much flatter and paler.

MOLLUSCUM CONTAGIOSA.

The beneficial result obtained here must be due to the erythema and increased phagacyosis as the organisms lie beneath the skin, so that bactericidal rays could not possibly reach them. The case described below was put on the Ultra Violet light more or less as an experiment and the result has been very good.

CASE I.

V.A. Female. Aged 26. Single.

This patient came up first on January 29th 1926 with Molluscum Contagiosa extending down the right side of her neck. The condition had appeared 10 months ago and was gradually spreading. She was treated by Ultra Violet light. Her first dose was given with the lamp open 9 ins. for 2 mins. and the results were very promising.

NAEVUS.

This condition responds very well to treatment and leaves very little scarring, thus making it superior to caustics CO₂ and the electrolysis needle. Also it is far less dangerous than radium.

It has also the advantage of being painless, so can be given quite easily to babies. The light is best given by pressure through a quartz lens. The Kronmayer is ideal but the ordinary mercury vapour fitted with the Kronmayer applicators does very well. Strong blistering doses should be given. The severe inflammation produces endarteritis, thus obliterating the vessels. Also any scarring which has been produced by previous applications of caustics is very much improved.

Under this same heading we may perhaps include telangiectasis, especially those following the excessive use of X rays or radium, as the little vessels are obliterated in much the same way.

CASE I.

M.S. Female. Age 6 months.

This patient came up first on April 29th 1925 with a naevus in the right cheek about the size of a shilling (port wine stain). She was given lot. calaminae. Her first two treatments were with the electrolysis needle. It was then painted once with acid trichloracetic, after which Ultra Violet light was tried. The treatments were applied by pressure through the quartz lens which is 10 ins. from the lamp and she was given 3 mins. This for a baby is a strong blistering dose. The naevus is now distinctly paler. The patient is still undergoing treatment and the last dose was through the lens for 5 mins. She has not come up very regularly and thus has not had as many treatments as one would imagine.

CASE II.

V.M. Female. Age 10.

This patient was first examined on December 1st 1925. She had a small naevus on her left cheek which had been treated with radium when she was two weeks old when a bleb was raised. She had five or six more treatments for two or three years and the last treatment was given six years ago, after which it was painted with CO₂ and collodion. On examination she had a dermatitis all round the original naevus which was small but the dermatitis extended over half her left cheek. There was a good deal of telangiectasis. She has been treated with Ultra Violet light and small patches have been painted with acid trichloracetic. The first dose of light was given through the largest diaphragm at a distance of 18 ins. for 2 mins. and the last 12 ins. 7 mins. Also, she has had one area treated twice by pressure through the quartz lens for 2 mins. She has had only 9 treatments and the lesion is already much paler and softer.

ONYCHIA.

Some of these cases which prove very resistant to all forms of treatment have considerably improved under Ultra Violet light. One instance is described below.

CASE I.

M.K. Female. Age 30. Married.

This patient came up first in July 1924. Both hands were affected, four fingers of the left hand and three middle fingers of the right. She was given ung.hyd. amm.dil. and 2 injections of collosol manganese, 1 cc. each time. In September she was given zinc ionisation. She had 8 treatments and there was a slight improvement. In November 1925 she was first given light treatment, the lamp was open at a distance of 16 ins. for 2 mins. She had 11 treatments, the last being 6 ins. 4 mins. Her hands are very much better and she herself says the improvement has been especially marked since she was given light treatment.

PERNIO.

Chilblain circulation is greatly relieved by Ultra Violet rays. They stimulate the sluggish circulation and also help by raising the calcium metabolism, many cases coming for treatment other than Pernio have stated that their chilblains have gone while under light treatment. One case treated for chilblains only is described below.

CASE I.

S.C. Female. Age 15.

This patient first came up on Dec. 8th 1925 with the history of bad chilblains which occurred every winter for the last 12 years. Both hands and feet had been affected, of late years especially her hands and this last winter her hands only. When she came up they were in a very bad state, quite raw and septic. She was put on to Ultra Violet and given ung.hyd.amm.dil to rub into the sores at night. She has had five treatments of light given at weekly intervals. They were all given with the lamp open and the light directed on to the hands. The first dose was at a distance of 10 ins. 2 mins. and the last for 6 ins. for 2 mins. She has responded very well. Her hands are quite healed and so far there has been no recurrence although the weather has been very cold. She has had no internal treatment. The patient states that if there is any sign of a commencing chilblain it aborts at once after a light treatment.

PSEUDO PALADE of BROCC (FOLLICULITIS DECALVANS).

The following case has been included as being interesting and worthy of note. The improved circulation of the scalp is doubtless responsible for the result. It is of course impossible to expect the hair to grow again on the atrophied areas but it is to be hoped that the treatment will effectually prevent the disease from spreading.

CASE I.

A.R. Female. Age 38. Married.

This patient first came up in February 1925 complaining that she had been losing her hair for the last two years. The bald patches of the scalp were very irregular, not round as an areata, and presented an atrophied appearance. Also they were not completely bald, there were occasional tufts sticking out in the centre, neither did it present the appearance of lupus erythematosus. The condition was diagnosed as pseudo palade of Brocc. She was given an ointment (ung. benzoin and acid sal. aa gr.xv). In March she was given lot. hyd. perchlor. 1 in 500. In May this was increased to 1 in 250. She started light in December 1925. It was given with the lamp open to the whole of the scalp at a distance of 6 ins. for 4 mins. She has had up to date 10 doses given twice weekly and the last was 6 ins. 8 mins. Since the light treatment there has been marked progress. The hair has almost ceased falling and it is hoped that the disease has been checked. She is still undergoing treatment.

PSORIASIS.

This condition clears up extremely well under Ultra Violet light, especially those cases which have not been treated previously. It is a much less messy form of treatment than the constant use of ointments, also extensive cases can be cleared up without hospital treatment such as chrysarobin. Much the same effect is obtained by the use of these rays as in the case of the last named treatment. The surrounding normal skin becomes deeply pigmented and finally the lesions peel off leaving behind pale areas as with chrysarobin. It is necessary to obtain a fairly severe erythema which is followed by a good deal of desquamation. It is particularly noticeable that the lesions themselves and skin surrounding for about $\frac{1}{4}$ inch peels more readily than the perfectly normal skin.

Light also seems to a certain extent to act as a prophylactic. Patients undergoing regular treatment, who usually get severe attacks every winter about the same time, have been enabled to get through without a fresh outbreak, and the winter having been passed it is to be hoped that they will remain free for some little time. It is noticeable that results obtained in this condition are extremely variable, some being extraordinarily resistant to all forms of treatment including light. A private communication from Dr. Rollier expresses his view that pigmentation of the skin seems to play the most important role with cure of psoriasis and refers to a case in which relapse occurred with disappearance of the pigmentation.

CASE I.

E.E. Female. Age 39. Single.

This patient first came up in August 1924 with psoriasis of two years' duration. She had a typical rash, especially marked round the abdomen, back and thighs. The areas were very large leaving very little normal skin in between. She was given ung.pet.co. (liq.picis.carb. $\frac{1}{2}$ drm. hyd.amm. gr. x parraf.molle.ad. 1 oz.) and 2 drms of collosol sulphur in water the first thing each morning, otherwise her sole treatment has been light. She has had 7 treatments given with the lamp open, the first at a distance of 8 ins. for 2.5 mins. and the last 12 ins. for 3 mins. The condition has entirely cleared up. In this case the peeling on and round the lesion mentioned above is most marked. The treatments were given weekly.

CASE II.

A.W.B. Female. Age 57. Married.

This patient came up first in May 1925 with psoriasis especially marked on the elbows and knees of three years' duration. It was her first attack. She had also a large area of varicose dermatitis on the inner side of the left ankle. Four years previously she had fractured this leg and it had united badly. The dermatitis and ulcer followed this trauma. It was very painful and she had often been obliged to lie up and rest the leg several weeks together. She was given collosol sulphur internally and ung.pet.co. (See above) - otherwise light was her only treatment. In all she has had 18 weekly treatments given with the lamp open and the light shining directly on to the various areas. The first dose being at a distance of 12 ins. for 3 mins. and the last 6 ins. 6 mins. After the first three treatments the leg was much less painful and at the end of her course the psoriasis had completely cleared/

cleared up, likewise the ulcer, and there was only the pigmentation left. Her last treatment was nearly 6 months ago and she has written just lately to say her leg is completely healed - there is no pain and she is able to use it all day long. There has, however, been some slight return of the psoriasis.

CASE III.

This patient came up in January 1926 with psoriasis of a rather seborrhoeic type situated mainly in the mid line of the back and chest also the scalp. For the scalp she was given ol.cadini.m. xv ol.sesame ad. 1 oz. and for the lesions on the body ung.pot.co. Ultra Violet light was administered to the back and chest. The first dose was given with the lamp open at a distance of 10 ins. for 2 mins. She is still undergoing treatment and so far has had only 4 doses. The lesions are already fading and the patient feels much better. This condition has persisted for 13 years on and off.

Case IV W.C.

Before Treatment



Case IV. W.C.

Showing result after 7 treatments



CASE IV.

W.C. Female. Aged 26. Married.

This patient came up first in January 1926 with an extensive psoriasis ruption, especially marked on the outer right thigh (See photo). Elbows, knees, ankles and legs were also affected. She was given lot. calaminae to soothe the irritation - otherwise Ultra Violet light has been her sole treatment. Her first dose was given with the lamp open at a distance of 16 ins. for 2 mins. She has had 7 weekly treatments, the last dose being 9 ins. 3 min. on March 8th 1926. She is very much better. She had very thick scaly lesions and these are now much paler and flatter and are rapidly disappearing.

CASE V.

H.G. Female. Age 22.

This patient came up first in January 1926 suffering from psoriasis of one month's duration. She was given ol. cadini. m.xx ol. sesame ad. 1 oz. to rub well in to the scalp and ung. pet.co. for the body. Ultra Violet light was administered with the lamp open to the chest and back. The first dose was 10 ins. for 2 mins. and the last dose up to date (5.3.26) 6 ins. 3 mins. She has only had 4 treatments and the psoriasis has very nearly disappeared, especially on the anterior and posterior thighs.

CASE VI.

J.H. Female. Age 54. Married.

This patient first came up in October 1924 with psoriasis on the arms, elbows, knees and thighs of six months' duration. She stated it was her first attack. She was given ung. pet.co. and the condition greatly improved but afterwards broke out again. She was then put on to light treatment. The first dose was given to the knees and elbows with the lamp open at a distance of 10 ins. for 2 mins. She was given 7 treatments, the last 6 ins. 2 mins. The condition is rapidly improving and the patient is still undergoing treatment.

CASE VII.

K.R. Female. Age 67. Married.

This patient came up first in April 1925 with very extensive psoriasis especially marked round the waist and on the knees. She was given three treatments of X rays, $\frac{1}{2}$ pastille dose each time and ung. sphagnol. In/

In November she was given Ultra Violet light. The first dose was given with the lamp open at a distance of 20 ins. for 1 min. She had 12 treatments the last being 6 ins. 3 mins. She is very much improved and is nearly clear. Also the patient states that she feels very much better in her general health.

CASE VIII.

B.J. Female. Age 13.

This patient was first examined in January 1926. She had psoriasis of the buttocks of the knees, arms and scalp. She was given ol.cadini.m.xv ol.sesame ad. 1 oz. for the head, ung.pet.co. for the body, also hyd.c.crete. gr. 1 o.m.s. She was given Ultra Violet light with the lamp open at a distance of 20 ins. for 2½ mins. to the limbs. To the scalp it was given at a distance of 12 ins. 5 mins. She has only had 12 treatments up to date, the last dose being 12 ins. 4 min. to the limbs and 6 ins. 4 mins. to the scalp. She has also had X rays to one or two patches on the legs 2 applications 1/3 of a pastille dose filtered through felt. She is much improved, all the areas are fading well. This is her first attack and has only been of a few weeks' duration.

CASE IX.

R.L. Female. Aged 40. Married.

This patient came up first in December 1924 with large patches of psoriasis principally on the back and buttocks. It is fairly extensive and some of the patches were very thick. It was the first attack and had lasted for about 12 months and the condition was getting worse. She was given ung.pet.co. and sulphur internally, also ol.cadini.m.xx ol. sesam.ad. 1 oz. to the scalp. She has had 10 doses of light given with the lamp open and rays directed on to the various lesions. The treatments were given weekly. The first dose was at a distance of 16 ins. 3 mins. and the last 9 ins. 3 mins. She has had X rays 1/3 of a pastille dose given once to an especially thick and indurated patch in the lumber region. She is now practically clear and there are no signs of any fresh patches appearing.

CASE X.

T.E.H. Female. Age 25. Single.

This patient first came up in April 1922. She has had psoriasis all her life and she has noticed that she/

she has always had, especially bad outbreak about December which is usually very extensive. For years she has been treated with the usual remedies, all kinds of ointments, arsenic, thyroid, etc. and a large number of applications of X rays given to various areas at different times. She first had light in August 1924 and on and off has had light continuously since then mostly at weekly intervals. She commenced with a dose of 24 ins. 3 mins. given with the lamp open and now tolerates 6 ins. 6 mins. Last winter, that is December 1924, she had influenza followed by an extremely extensive and severe outbreak which has only been treated by light. Although practically clear after about 6 months' treatment, she continued her light baths during the autumn and this winter for the first time for many years she has had no fresh patches. She hopes now that she will remain entirely free all summer and that by always taking light treatment in the winter months to keep fairly clear.

SCLERODERMIA.

The etiology of this condition being obscure, it is difficult to account for the good results produced by Ultra Violet light. Probably it is due to the increased supply of blood to the part - at all events Ultra Violet Light seems to have the property of softening scar tissue, and if given in sufficiently strong doses, is useful in treating keloid, although of course X rays bring about far more rapid results in such cases. In Sclerodermia, however, especially as the lesions are often multiple Ultra Violet is a very convenient method.

CASE I.

P.M. Female. Aged 9.

This patient first came up in August 1925. She had then a linear patch of sclerodermia just below and in front of the right ear which had persisted for two months, there was no history of any trauma. She was given ung. ac. sal. and light treatment. The first dose was given through the largest diaphragm at a distance of 16 ins. for 3 mins. and the last at 6 ins. for 3 mins. She has had 20 treatments. The patch is now quite soft and can hardly be felt and is scarcely visible.

CASE II.

E.G. Female. Aged 50. Married.

This patient first came up in January 1925 with several small patches of sclerodermia on the chest of two and a half years' duration. Ultra Violet light has been her sole treatment. Treatment has been given at weekly intervals with the lamp open and the commencing dose was at a distance of 20 ins. for $2\frac{1}{2}$ mins. This had gradually been increased to 9 ins. 5 mins. and the patient was doing very well, the lesions having become quite soft, when the patient discontinued treatment for 3 months. She returned in January 1926 stating that she had been very ill with gallstones and was only just allowed about again. In the meanwhile some new patches had appeared and the old ones had relapsed. She recommenced treatment, starting at a distance of 9 ins. for 4 mins. So far she has only had 5 treatments this time but the patches seem to be getting softer once more. This patient is very resistant to light and it is extremely hard to get her to desquamate. A sufficient number of these cases have not been treated to say whether this is typical of the condition.

VARICOSE DERMATITIS AND ULCER.

This is a condition which responds extremely well to Ultra Violet Rays. The stimulation produces an improvement in the sluggish circulation thus getting to the root of the trouble and the improvement takes place while the patient continues to use the limb - a great advantage, as the complete rest often so necessary in order to produce good results while other methods are being employed, is extremely difficult and often impossible to obtain in the class of patient in which these ulcers seem to flourish.

Not only varicose but almost all chronic ulcers do well with Ultra Violet rays. They have a two-fold action, stimulating and antiseptic. Purulent discharges are soon rendered less septic, healthy granulations are formed and the ulcers heal in from the sides. Only a mild erythema is produced each time and many of the treatments are given bi-weekly.

CASE I.

A.J. Female. Age 43. Married.

This patient came up first in October 1925 with varicose dermatitis of ten years' duration on the inside of the right leg. During the last five months a small ulcer/

ulcer about the size of a shilling has broken out in the centre of the patch. Beyond an ointment pasta zinci c. ichthyol 2%, the patient has been treated by Ultra Violet light alone. She has had 11 weekly treatments. The first dose was given with the lamp open at a distance of 14 ins. for 2 mins. This has gradually been increased according to the reaction produced, the aim being to produce as light stimulating erythema without causing much discomfort to the patient, and the last dose was given with the lamp open at a distance of 6 ins. for 3 mins. Treatments have always been given with the lamp open and the light directed on to the lesions.

When she first came up her leg was very painful, but now with the exception of occasional slight irritation, she suffers no discomfort whatever and the ulcer is quite healed. She has never had to lie up and rest the leg since she started the light treatment but always wears a supporting bandage.

CASE II.

H.R. Female. Age 45. Married.

This patient came up first in June 1923 with varicose dermatitis of the left leg of three or four years' duration. She was given lot. triplicis (calamine lotion containing 5 grains of carbolic acid and 2 m. of strong solution of lead) and mist. alba. She came very irregularly and the condition remained much the same. In July 1924 she was put on to parathyroid one-tenth of a grain twice a day, also pasta. ac. sal. and collosol sulphur internally. In October 1925 light treatment was tried. She started with the lamp open at 16 ins. for 2 mins. She has had 16 treatments and the last was 6 ins. distant for 3 mins. The ulcer has very much improved, especially since the light treatment.

CASE III.

I.I. Male. Age 55. Married.

This patient came up in September 1925 with a large punched out ulcer situated on the outer and posterior aspect of the left leg. It was linear and about 4 or 5 ins. in length. It was only of 4 months' duration. It very strongly suggested specific origin although the Wassermann was negative. Nevertheless he was given a mixture containing mercury and potiod. In October he was put on to light treatment. The first dose was given with the lamp open at a distance of 14 ins. 2 mins. He has had 18 treatments given weekly, the last being 6 ins. distant for 3 mins. The/

The ulcer has completely healed for 1/3 of its length and the remaining part shows very healthy granulations, no other local treatment was applied. It is possible that the good results obtained in this case were to a large extent due to the pot.iod. and mercury, although it is only since he was put on the light that it commenced to heal so rapidly. But this only serves to illustrate the statement made by Ostermann of Vienna that light in the presence of heavy metals enhances their therapeutic value.

CASE IV.

T.M. Male. Age 44. Married.

This patient came up in December 1925 with a large square or rather rectangular ulcer about 4 by 3 ins. situated on the anterior aspect of the left leg. The Wassermann was negative. Nevertheless he too was given mercury and pot.iod. as well as light treatment. The first dose was given with the lamp open at a distance of 14 ins. 2 mins. He has had 7 treatments up to date, the last being at a distance 6 ins. for 3 mins. The ulcer is distinctly less painful and healing well at the margins though there is still some septic discharge and unhealthy heaped up granulation tissue in the centre.

CASE V.

M.S. Female. Age 62. Married.

This patient came up first in July 1925 with a punched out linear ulcer situated in the outer aspect of the right ankle. She gave a mercury Wassermann. She was given ung. ac. bor. also mercury and pot.iod. internally. In September she was given her first dose of Ultra Violet light with the lamp open at a distance of 14 ins. for 2 mins. So far she has been given 12 treatments, the last at a distance of 7 ins. for 4 mins.

There is very little pain now and the ulcer is healing and looks in a very healthy condition.

XANTHOMA PALPEBRARUM.

Only one case of this condition has been treated with Ultra Violet light, it has responded so rapidly that it has been included here. Strong doses were given sufficient to produce a blister and when the inflammation had died down and desquamation taken place, the condition had practically cleared up. Xanthoma is now known to be a definite reaction brought about by an excess of cholesterol in the blood and some authorities state that a mild inflammation may be the cause of a sudden deposit in the tissues. From/

From this case it seems that a more or less severe inflammation will bring the cholesterol to be absorbed and the cure may be only temporary.

CASE I.

M.C. Female. Age 36. Married.

This patient came up first in January 1926 with bright yellow plaques on both the upper and lower lids of both eyes. Local treatment was given by the means of Ultra Violet light applied with pressure to the ten inch quartz lens directly on to the lesions. She commenced with 4 mins. and has been gradually increased to 6 mins. She has only had 6 treatments, one place being treated at a time, and where light has been applied twice it is entirely cleared up. There is still a small patch on the upper lid of the right eye.

XERODERMIA.

Ultra Violet Light is excellent for softening the dry harsh skins of Xerodermic subjects. A sufficient dose is given in order to produce desquamation and when the harsh outer skin has been removed in this way over a fairly long period new skin grows much softer and the results obtained seem to be fairly permanent.

CASE.

K.E. Female. Age 12.

This patient first came up in March 1925. Her skin was very harsh and rough all over especially the legs and hands which in cold weather would get very dry and covered with painful cracks. She was given thyroid gr. 1 o.m.s., also paraff.molle. to rub into the harsh places. She commenced light treatment in July 1925. The first dose was given to the legs with the lamp open at a distance of 14 ins. for 2 mins. She has had 14 treatments and the last was at a distance of 6 ins. for 3 mins. The legs are very much softer, also she has kept her hands under the light during most of her treatments and she states that this winter she has had hardly any painful cracks.

SECTION VI.

SUMMARY AND GENERAL CONCLUSIONS.

The notes on the above series of cases serve to show what a very large number of varying types of skin diseases can be benefited by the use of Ultra Violet rays and a few general conclusions can be drawn from them. The cases are not consecutive in the order of their appearance at hospital but have been selected in a haphazard manner, not according to their progress, but because they are typical examples of the various diseases so treated.

Some cases such as lichen and lupus erythematosus have been purposely excluded as they do not appear to benefit from light, but no attempt has been made to exclude cases in the diseases given because their progress has been slow or not as satisfactory as one might expect.

The following is a tabulated list of the cases described:-

Disease	No. of cases described	Case No.	Duration of disease	Total No. of Light Treatments	Result.
Acne		1	1 year	21	Improving
Vulgaris	2	2	2 years	38	Improving
Adenoma		1	3 years	11	Improving
Sebaceum	2	2	?	25	Improving
Alopecia	4	1	14 $\frac{1}{2}$ years	23	1 in. growth all over head
		2	4 years	16	Strong vigorous growth all over head
		3	14 days	11	1 in. growth
		4	4 years	5	Improving
Erythema					
Multiforme					
Bullosa	1	1	3 weeks	14	Cured
Erythema		1	3 years	13	Cleared up
Induratum	2	2	?	20	Completely healed
Furunculosis	1	1	? 2 years	weekly for 6 months	Cleared up
Herpes Zoster	1	1	Neuralgia 1 year	6	Much improved Unable to continue
Impetigo					
Contagiosa	2	1	1 week	12	Cured
& Sycosis		2	14 days	3	Cured
Leucodermia	1	1	3 years	48	Much smaller
Lupus	7	1	4 $\frac{1}{2}$ years	29	Greatly improving
Vulgaris		2	3 years	24	Apparently cured
		3	9 years	27	Cured
		4	8 years	63	Improved. Some areas cured
		5	10 years	27	Cured
		6	?	30	Improving
		7	3 years	26	Greatly improving
Lymphangioma	3	1	?	21	Improving
		2	7 years	19	Improving
		3	Since birth	7	Improving
Molluscum	1	1	10 months	2	Distinctly promising but did not continue
Contagiosa					
Naevus	2	1	Birth	? Irregular	Much paler
		2	Birth also radio dermatitis	9	Paler and softer

Disease	No. of cases described	Case No.	Duration of disease	Total No. of Light Treatments	Result
Onychia	1	1	3 years	11	Improving well
Pernio.	1	1	12 years	5	Cured for the season
Pseudo Palade	1	1	2 years	10	Improving well
Psoriasis	10	1	2 years	7	Entirely cleared
		2	3 years	18	" " up
		3	13 years	4	Improving
		4	?	7	Improving well
		5	1 month	4	Nearly clear
		6	6 months		
			1st attack	7	Improving
		7	?	12	Nearly clear
					General health much improved
					Improving
	8	a few weeks	12	Improving	
	9	12 months	10	Practically clear	
		10	all her life	weekly doses for 1 yr as a prophylactic as well as curative agent	No fresh lesions this year
Sclerodermia	2	1	2 months	20	Scarcely visible & quite soft
		2	2½ years	5	Improving slowly
Varicose	5	1	10 years	11	Ulcer healed
					Dermatitis much improved
		2	3 or 4 years	16	Much improved
		3	4 months	18	Healing rapidly
		4	?	7	Improving
	5	?	12	Improving	
Xanthoma					
Palpebrarum	1	1	Some months	6	Practically clear
Xerodermia	1	1	Since birth	14	Much improved skin no longer cracks.

Out of the 50 cases given it will be seen that 7 were lupus vulgaris, 10 psoriasis, 5 ulcers and 4 alopecia, and it would seem that these are perhaps the commonest among the skin conditions sent for light treatment.

Most observers agree that in the treatment of tuberculosis, whether in the realms of general medicine or of dermatology, Ultra Violet Light is a great advance on all older methods. Its utility in cases of lupus has ceased to be questioned though there are some who doubt if a permanent cure can be established by Ultra Violet radiation alone. It is true it is a slow process but there seems to be no reason why a permanent cure should not result if the treatment is persisted in. Some of the cases described above have been discharged as cured although they are to return from time to time in order that any recurrence, if it should take place, may be detected immediately. Ultra Violet light makes no claim to be a permanent cure for psoriasis, neither does it clear up individual lesions any quicker than when treated with chrysarobin, but it is a much more agreeable method of treatment, also it appears to act to some extent as a prophylactic agent. Rollier, too, seems to have found this, as his patients, while undergoing heliotherapy, lose their psoriasis and remain free.

With the exception, perhaps, of lupus, light should not be looked upon as a specific in all skin diseases but as an extremely useful adjunct. Most cases will benefit from it, especially when other suitable remedies, the properties of which it seems to enhance, are given at the same time, and many chronic cases, such as indolent ulcers, alopecia of long standing, etc., can be stimulated by light when they fail to respond to lotions and other methods.

It is exceedingly useful in septic conditions, both superficial by direct radiation and deep by the increased haemobactericidal power, and it is an excellent general tonic. It can also be used with advantage in place of X rays in cases where prolonged treatment is necessary and one is frightened of over doses.

Cases of ringworm of the scalp have been successfully treated with Ultra Violet Light but it is necessary, in order to get the best results, to use the Kronmayer lamp so as to get the largest number of bactericidal rays in contact. An acute inflammation is produced sufficient to cause blistering and epilation of the diseased hairs and it is possible to cure such cases quickly without the danger of permanent baldness which is always present when X rays are given to the whole scalp. Unfortunately the author has no personal experience of such cases owing to the lack of a Kronmayer lamp.

It will be noticed that no mention has been made of lupus erythematosus and lichen planus. Light treatment has been tried on both these diseases in a fairly large number of cases and no definite improvement has resulted. Lichen does well with X rays, and except in the diffuse type, separate patches are quite easily treated by this method. Howard Humphris claims that the diffuse type, which does not respond well to X rays, does well with Ultra Violet Light/

Light, but no suitable cases have come under the writer's observation in order to confirm this observation.

With regard to lupus erythematosus there is still some doubt as to its etiology. The theory that it is not a separate disease, but the result of various toxæmias of different origins such as intestinal, tubercular and syphilitic, may account for this, for if this is the case, it does not seem possible to hope for much success until the root of the trouble has been attacked. Some authorities have mentioned that rodents improve under Ultra Violet radiation but X rays and radium are far more potent and should be given preference. Light, however, may be applied in mild doses during the interval elapsing between two full doses of X rays but it is doubtful if much is gained.

Other conditions which do well with light are seborrhoea, both of the body and the scalp, especially the greasy type of scalp, and pruritis, both general and local, is greatly relieved. Possibly in this condition the light has some effect on the nerve endings, as usually anything producing erythema, such as heat, only aggravates the condition.

With regard to pigmentation in the treatment of skin diseases, it has not been noticed that a better result is obtained in people who pigment easily, in fact its presence is rather a drawback than otherwise as it protects the skin and makes it difficult to produce the violent erythema so necessary in the treatment of chronic stubborn skin conditions/

conditions. This is yet another reason why the mercury vapour lamp is to be preferred to the open arc, as even after prolonged and heavy exposures, the tendency to pigment is not particularly marked.

No contra indications in the treatment of skin diseases by light have been observed, except perhaps in elderly people who have been abroad and have a senile, dry and wrinkled skin with patches of deep pigmentation, telangiectasis and roughened patches, which condition, according to Professor Dubreuilh of Bordeaux, is the remote result of prolonged exposure to sunlight and is apt to go on to malignant change. Also cases such as hydroa aestivalis^e which are brought about by exposure to light. But among all the numerous cases treated in the hospital no cases of malaise following irradiation have been recorded. Possibly this may be because few general light baths are given. Most of the treatments being local although many of them extend over large areas.

These conclusions have been arrived at after watching the progress and results of many cases treated in the Light Department at St. John's Hospital for the past two years and the series of cases described have been selected as being typical examples of the results obtained with light treatment.

The photographs were taken at St. John's Hospital under/

Ultra Violet Light. Indoor photographs are easily taken in this way without a time exposure and in photographing skin lesions every little mark shows up with exceptional clearness.

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